ORIGINAL ARTICLE

Preventing drug related morbidity: a process for facilitating changes in practice

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Aim: To describe how quantitative data obtained from applying a series of indicators for preventable drug related morbidity (PDRM) in the electronic patient record in English general practice can be used to facilitate changes aimed at helping to improve medicines management.
Design: A multidisciplinary discussion forum held at each practice facilitated by a clinical researcher.
Subjects and setting: Eight English general practices.
Outcome measures: Issues discussed at the multidisciplinary discussion forum and ideas generated by practices for tackling these issues. Progress made by practices after 1, 3, and 6 months.
Results: A number of clinical issues were raised by the practices and ideas for moving them forward were discussed. The issues that were easiest and most straightforward to deal with (for example, reviewing specific patient groups) were quickly addressed in most instances. Practices were less likely to have taken steps towards addressing issues at a systems level.
Conclusions: Data generated from applying PDRM indicators can be used to facilitate practice-wide discussion on medicines management. Different practices place different priority levels on the issues they wish to pursue. Individual practice ''ownership'' of these, together with having a central committed figure at the practice, is key to the success of the process.

Recent government policy documents from the USA[1] and the UK[2 3] have raised the profile of the problem of drug related morbidity. Furthermore, drug related problems have been identified in a systematic review[4] as a frequent cause of hospital admissions. In a recent UK study[5] 6.5% of admissions to a hospital medical admissions unit were considered to be drug related, with 67% of these judged to have been preventable. Preventable admissions were found to be caused mainly by problems with prescribing and monitoring of drug treatment.

The adverse clinical outcomes of drug related morbidity are potentially substantial, while the economic impact in ambulatory care patients in the US has been estimated to cost $177 billion each year.[6] Clearly, the humanistic and economic benefits of reducing potentially preventable drug related morbidity (PDRM) are likely to be great.

In a previous paper[7] we described a pilot study in which a series of indicators representing PDRM were applied in the electronic patient record in English general practice. This study showed that a substantial number of potential PDRM events are occurring in English primary care. Identification of these events now enables strategies to be developed for the reduction of future PDRM. A number of different approaches have been proposed to improve the quality of professional practice with varying degrees of success. These include the use of guidelines,[8] audit (with or without feedback),[9] and educational outreach.[10]

The objective of this qualitative paper is to describe how the quantitative PDRM data[7] were used to generate discussion through multidisciplinary discussion feedback sessions at individual practice level. The purpose of these sessions was to facilitate changes in practice to help improve the management of medicines.

METHODS

The practices

Practices from three primary care trusts (PCTs) (two from the East Midlands and one from the North-West areas of England) were recruited to the study. A PCT combines primary care and community care services in a single organisation in a geographical area, typically covering a population base of about 100 000. Practices were eligible for inclusion if they were willing (1) to allow the research team to use the MIQUEST computer software program to conduct a retrospective anonymised review of electronic patient records to identify the number of PDRM events in patients over the age of 18 over a period of 2 years and 3 months; and (2) to comment on the PDRM events data collected via a multidisciplinary discussion forum facilitated by a clinical researcher. The inclusion criteria solely related to the technical aspects of data collection have been previously described in full elsewhere.[7]

In the North-West, the local pharmaceutical adviser was contacted before the study to engage formal support from the PCT pharmacists responsible for the study practices.

Research ethics committee approval was obtained in each locality.

PDRM indicator data

A series of indicators for PDRM were applied in the computerised database of each practice.[7] Before the feedback meeting, each practice was provided with an individualised list detailing each indicator, together with the number of events identified for that indicator in their practice. These data are shown in table 1 for each individual practice.

Process for facilitating change

The results were fed back in each practice through a multidisciplinary discussion forum facilitated by a clinical researcher (CJM or RLH) and attended by key practice personnel. Although the practices determined staff representation at this forum, we suggested that it included the general practitioners (GPs), at least one representative from the

Abbreviations: PCT, primary care trust; PDRM, preventable drug related morbidity

Table 1 Number of potential PDRM events by indicator at each individual practice

Indicator details	Practice 1	2	3	4	5	6*	7
Outcome: GP practice or hospital contact due to CHF and/or fluid overload *Pattern of care:* Use of an oral/topical NSAID for ⩾3 months in a patient with hypertension and/or CHF	9	7	9	10	15	15	–
Outcome: Raised serum creatinine (creatinine level ⩾150 μmol/l) *Pattern of care:* Use of an ACE inhibitor without monitoring the creatinine level before starting treatment, within 6 weeks of commencement, and at least annually thereafter	12	21	9	12	3	8	5
Outcome: Hyperkalaemia (potassium level ⩾5.5 mmol/l) *Pattern of care:* Use of an ACE inhibitor without monitoring the potassium level before starting treatment, within 6 weeks of commencement, and at least annually thereafter	10	5	6	4	3	12	2
Outcome: Fall or broken bone *Pattern of care:* Use of a long half life hypnotic-anxiolytic	5	5	2	11	3	15	2
Outcome: A second MI *Pattern of care:* In the absence of any contraindication, failing to prescribe a β blocker in a patient with a history of MI	5	7	2	3	1	19	–
Outcome: Dyspepsia or upper GI bleed or GI perforation or GI ulcer or anaemia *Pattern of care:* Use of an oral/topical NSAID for ⩾1 week in a patient with a history of peptic ulcers or GI bleeding	7	1	4	2	2	2	–
Outcome: GP contact or hospital admission due to worsening symptoms of CHF *Pattern of care:* In the absence of any contraindication, failing to prescribe an ACE inhibitor to a patient with known CHF	3	2	–	1	2	7	–
Outcome: Blood dyscrasias *Pattern of care:* Use of carbamazepine without a full blood count before treatment is initiated and periodically during treatment	4	3	6	1	–	–	–
Outcome: GP practice or hospital contact due to asthma symptoms *Pattern of care:* Use of an inhaled short acting bronchodilator more than once daily or at night in an asthmatic patient with no regular inhaled ''preventer'' therapy (corticosteroid or cromoglicate or nedocromil)	7	1	–	–	–	–	–
Outcome: GP or hospital contact due to an exacerbation of asthma or COAD *Pattern of care:* Use of β blocker in a patient with asthma or COAD	3	2	1	–	1	3	–
Outcome: A minor or major haemorrhagic event *Pattern of care:* Use of warfarin without monitoring the INR before initiation of treatment, on alternate days in the early days of treatment, then at longer intervals and at least every 3 months thereafter	4	1	–	2	4	–	–
Outcome: Hypokalaemia (potassium level ⩽3.0 mmol/l) *Pattern of care:* Use of a potassium wasting diuretic without (1) concurrent use of a potassium supplement *or* (2) concurrent use of a potassium sparing diuretic *or* (3) monitoring the potassium level at least annually	3	1	–	1	1	4	–
Outcome: A second MI *Pattern of care:* In the absence of any contraindication, failing to prescribe aspirin in a patient with a history of MI	1	1	–	2	–	7	–
Outcome: Oral thrush/dysphonia *Pattern of care:* Use of an inhaled steroid by high dose metered dose inhaler without use of a spacer device	1	1	3	1	–	1	–
Outcome: GP practice or hospital contact due to hyperthyroidism *Pattern of care:* Use of a thyroid agent without monitoring T_4 or TSH within 6 weeks of initiating treatment and at least every 12 months thereafter	–	1	–	3	–	1	–
Outcome: A minor or major haemorrhagic event *Pattern of care:* Concurrent use of warfarin and an oral/topical NSAID without monitoring the INR within 10 days	1	–	–	–	2	–	–
Outcome: Acute urinary retention *Pattern of care:* Use of an anticholinergic agent in a patient with a history or current diagnosis of benign prostatic hypertrophy	1	–	–	–	–	–	–
Outcome: Serum transaminase concentrations raised to three times the upper limit of the reference range or clinical jaundice *Pattern of care:* Use of a statin without monitoring liver function before starting treatment, within 3 months of commencement, and then at 6 monthly intervals thereafter	–	1	–	–	–	1	–
Outcome: GP or hospital contact due to a deterioration in symptoms or an acute exacerbation of asthma or COAD *Pattern of care:* Prescribing β blocker eye drops to a patient with a history of asthma or COAD	–	–	–	–	–	1	–
Outcome: GP practice or hospital contact due to CHF and/or heart block *Pattern of care:* Use of digoxin in a patient with CHF, with heart block or advanced bradycardia	1	–	–	–	–	–	–
Outcome: Worsening of Parkinson's disease symptoms (e.g. attacks of rigidity or tremor) *Pattern of care:* Use of metoclopramide in a patient with a history of Parkinson's disease	–	–	–	–	–	1	–

CHF, congestive heart failure; NSAID, non-steroidal anti-inflammatory drug; MI, myocardial infarction; ACE, angiotensin converting enzyme; GI, gastrointestinal; COAD, chronic obstructive airways disease; INR, international normalised ratio; TSH, thyroid stimulating hormone.
*Two separate practices treated as one for the purpose of the study.

nursing staff, the practice/PCT pharmacist, and the practice manager. The role of the clinical researcher was purely as a facilitator for the meeting; practice staff were responsible for following up any issues. To facilitate this, a lead person within the practice was identified. The meeting was audio-taped, with permission, to ensure that there was an accurate and complete record of each meeting's discussion. The purpose of the meeting was to discuss the indicator data in an open non-judgmental way using some of the key principles of root cause analysis[11] if appropriate. Open discussion of the study data enabled practice staff to have the opportunity to try to define and understand specific problems, to identify the cause of the problem (root cause identification), and to explore how the problem could be solved (root cause elimination). At the outset, we understood that the application of root cause analysis was likely to be at a basic level. If the issues raised had not been considered previously, then the meeting would serve to encourage practice staff to explore the issues and consider the broader principles involved.

Practice follow up

The lead person within each practice was contacted by the clinical researcher by telephone at intervals of 1, 3, and 6 months to gauge progress.

Data analysis

The transcripts were reviewed by CJM. From these, a summary document was prepared to ensure that all of the issues raised were covered on follow up.

RESULTS

Practices

Data are reported from eight practices. Two of the practices had linked computer support and routinely combined educational and practice meetings. At their request, they were treated as a single practice (practice 6). Practices 1–4 were located in the East Midlands and practices 5–7 in the North West of England. The number of GP partners ranged from 1 to 4. Four practices held GP training status and they were located in urban (n = 2), suburban (n = 3), and rural areas (n = 2).

Practice engagement with the process

Inter-practice and intra-practice variation was evident in the way practices engaged with the process. All practices viewed it in a positive light, with the exception of one (practice 1) which refused further involvement in the study after the discussion forum. In this practice the GPs felt that changes had already been instigated by the practice for many of the indicator issues (such as regular monitoring of statins) or were simply unnecessary—for example, monitoring of thyroid function was carried out by the local hospital. However, GPs from the other practices commented that it had been a useful exercise. Most felt they had benefited from their involvement as it had encouraged them to view some specific issues in a systematic way and increased their awareness of what they were and were not currently doing.

In terms of intra-practice variation, one or two members of staff (often GPs, but occasionally the practice manager) generally showed greater enthusiasm than others. Despite this, there was sometimes difficulty in getting one of the practice staff to take responsibility for following issues through. This was particularly noticeable in practices 1–4, and was less evident in practices 5–7 where PCT pharmacists formally supported the study.

Table 2 Breakdown of staff representation at each discussion forum

Practice	Number of attendees	Personnel present
1	6	GPs (×3); practice nurse; practice manager; local community pharmacist
2	12	GPs (×5); GP trainee; practice nurses (×3); receptionist; audit coordinator; pharmaceutical adviser
3	11	GPs (×5); GP trainee; practice nurses (×2); auxiliary nurse; student nurse; practice manager
4	5	GPs (×4); practice nurse
5	10	GPs (×2); practice nurses (×2); practice manager; receptionist; secretarial staff (×2); PCT pharmacist; PCT pharmacy technician
6	11	GPs (×8); practice nurses (×2); PCT pharmacist
7	5	GPs (×3); practice manager; PCT pharmacist

Multidisciplinary discussion forum

Staff representation at each meeting was variable (table 2). Although suggestions made by the research team were often followed, the final attendance was also influenced by practice staffing on the day and the level of interest among individual staff members about the study.

The issues discussed within each meeting varied. This was largely dependent upon the results for each practice (table 1) and the level of importance placed on particular issues by those staff members present. As expected, staff often only got as far as identifying the additional information that was required to be able to understand the problem fully. The outcome of the meeting then became tasking someone to access that information. The process of change management was therefore not formally addressed within the facilitated meeting.

The issues that practices were prepared to take forward are shown in box 1. In addition, some practices wanted to address issues in a way that could be helpful in the longer term. Illustrative quotes for two examples are shown in box 2. The issues that practices discussed but discounted for further action are shown in box 3, together with illustrative quotes.

It is notable that some practices discounted following up specific patient groups. This was not because they thought the issue unimportant but, rather, they deemed it unnecessary. It was often something the practice had taken upon themselves to review in the time between data collection and the discussion forum or had recently been the subject of a

Box 1 Clinical issues to be taken forward by practices as a result of the discussion forum

- Follow up of patients not prescribed aspirin or a β blocker after MI (practices 2, 3, 6).
- Follow up of all asthmatic patients prescribed oral β blockers (practices 3, 5).
- Reviewing blood results of patients prescribed carbamazepine (practice 3).
- Addressing the uncertainty relating to INR results when issuing warfarin on repeat prescription (practices 2, 6, 7).
- Reviewing the use of spacers with patients prescribed high dose metered dose inhaled steroids (practices 2, 3).
- Audit of monitoring of urea and electrolytes of patients prescribed ACE inhibitors in the last 12 months (practices 4, 5, 6).

Box 2 Illustrative quotes for examples of issues perceived to be helpful in the longer term

Example 1: *''… this is potentially a big, big problem (patients not prescribed aspirin or beta-blockers post MI) but a lot of these patients, it may be that they're contraindicated but they need following up and (PCT pharmacist name) lets say would you go through and make sure that the contra-indication bit of the (computer ischaemic heart disease) template is filled in.''*

Example 2: *''… a number of these we've got systems (computerised templates for chronic disease management) for picking them up, but there are some (carbamazepine and blood dyscrasias) that I'm not aware that we've got systems … so that is a useful thing to look at particularly as you've highlighted two people with low platelets.''*

PCT audit—for example, reviewing the use of aspirin in patients following myocardial infarction.

The issue of the long term use of benzodiazepines generated considerable debate in some practices. While acknowledging the problem of assigning causality of falls and fractures to the prescribing of long term benzodiazepines, it was generally considered an important issue. However, due to the potential problems associated with withdrawing these drugs from patients (introducing carefully controlled withdrawal regimens and the reluctance of some patients to stop treatment), no practice wished to pursue this further.

Follow up by clinical research staff

In most practices telephone follow up by the clinical researcher at 6 months was redundant. These practices had addressed issues wherever possible almost straight away and by 3 months felt they had completed what they set out to do. In most cases practices quickly addressed the issues that were easiest and most straightforward to deal with. Reviewing specific patient groups—for example, asthmatic patients prescribed β blockers—was done often within the first month. However, once these ''easy'' issues were addressed, practices often moved on to other issues precipitated internally by the practice or by PCT initiatives. Practices were less likely to have tackled issues at a systems level. Although one practice had set up a template on their computer system for annual monitoring of the full blood count for patients prescribed carbamazepine within 3 months, another was still in the process of defining the level of monitoring for angiotensin converting enzyme inhibitors at the 6 month follow up.

It was notable that individual practices sometimes viewed the same indicator in a different light. The example given in fig 1 shows the response of four different practices to the same indicator. It illustrates how practices may find different solutions to the same problem and the impact that staffing levels may have on any progress made.

The issue of warfarin monitoring in the UK is slightly complicated by the fact that patients in a single practice may be having their international normalised ratio (INR) test undertaken in a variety of different locations. While the results are reported in the patient-held anticoagulant book, in some cases they are not found on the practice computer system. The importance of this should not be underestimated since warfarin (or anticoagulants as a class) have routinely featured highly as a cause of morbidity in studies investigating adverse drug reactions as a cause of admission to hospital,[12–14] and in a study of the incidence and preventability of adverse drug events in primary care.[15]

Box 3 Issues discounted for further action

- Follow up of specific patient groups—for example, those not prescribed aspirin or a β blocker after MI (practice 2, 3, 4).

''… we do these regular audits every six months on a lot of these criteria''

- Addressing the uncertainty relating to INR results when issuing warfarin on repeat prescription (practice 5).

''There's a very clear responsibility, in my mind, that it's whoever doses the patient is responsible for all of these matters, and we are simply a means of supplying the tablets (warfarin) for somebody else to decide how many they're to take … but I've no doubt in my mind that it's the laboratory's responsibility and positively not ours … It's probably one of the few situations where we sign the prescription but don't carry ultimate responsibility for what happens.''

- Follow up of patients prescribed long term benzodiazepines (practices 3, 5, 6, 7).

'' … that's kind of a withering vine … because we are tending to use much less (benzodiazepines) … but we are aware of that as an issue ... but how do we progress it further without causing angst (to patients)?''

DISCUSSION

This study has shown that data generated from applying PDRM indicators in the electronic patient record can be used to facilitate practice-wide discussion on medicines management issues. A multidisciplinary forum provided practice staff with the opportunity to review processes of care for specific groups of patients and to explore possible solutions openly. Indeed, the approach taken in our study is consistent with that advocated by the UK's National Patient Safety Agency (reflection on practice and viewing events at a systems level) following patient safety incidents.[16]

While it is possible that those practices who volunteered for the study were likely to be most amenable to change, there is no clear evidence that in reality this was the case. Indeed, with error reporting gaining a higher profile within the broader context of the patient safety agenda, this type of approach is likely to become increasingly appealing to general practices in the future.

In the present study different practices clearly placed different priority levels on the issues that they wished to take forward. Individual practice ''ownership'' of these, together with having a central committed figure at the practice, appeared key to the success of the process. Unsurprisingly, ''easier'' solutions (such as reviewing specific patient groups) were more likely to have been followed through than changes at a systems level. System changes are likely to be inherently more difficult to address and are often longer term issues. While in principle making a change to a practice computer system at a local level might seem straightforward, in practice this is not always so.

This study, building on feasibility work,[17] enabled us to assess our methodology critically in practices differing in terms of both geographical location and demographic background. All participants were provided with comprehensive written information about the purpose of the multidisciplinary forum and what was expected from them in advance of the study. Despite this, one practice withdrew at an early stage. This may reflect the fact that, in contrast to the other practices, they refused the offer of a

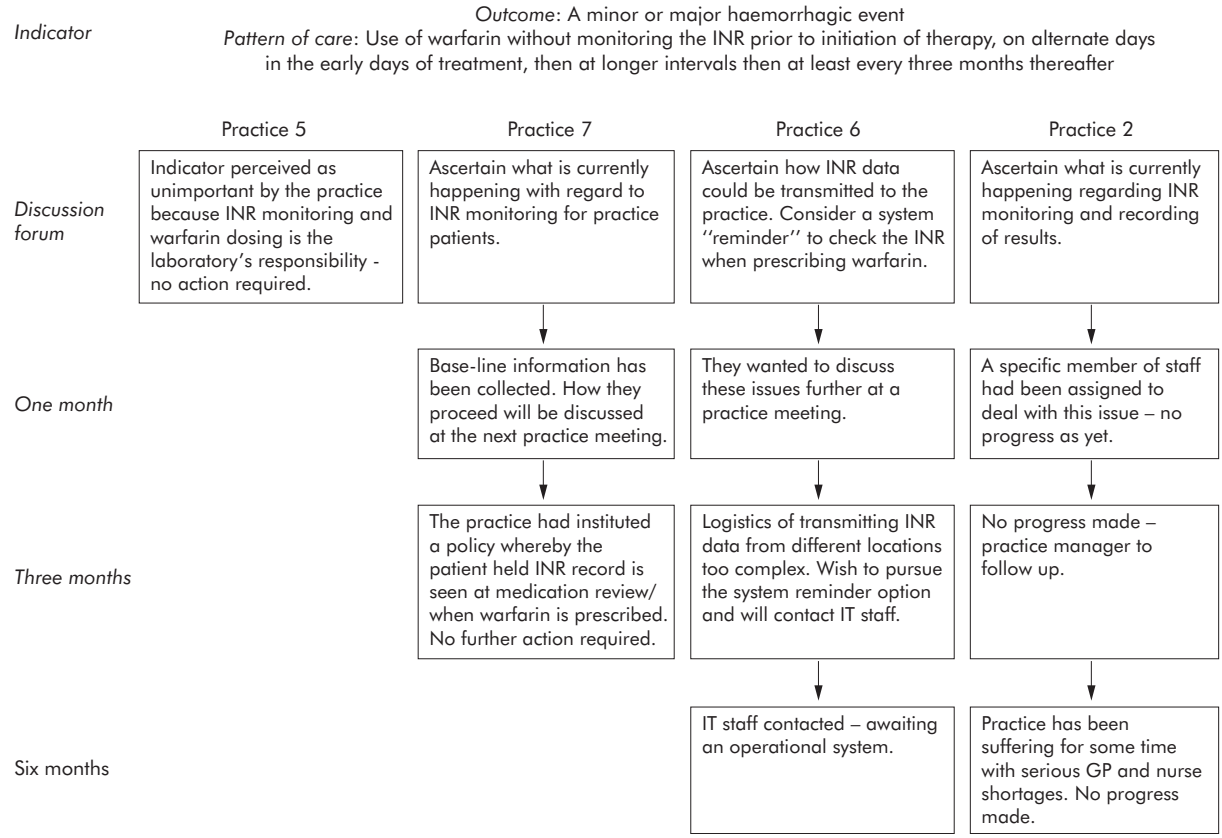

Figure 1 Diagram showing how four different practices approached the issue of international normalised ratio (INR) monitoring from the point of the discussion forum to the 6 month follow up (if applicable).

preliminary meeting designed to clarify that information and answer any questions or concerns in advance of the discussion forum. It also highlights the potentially problematic issue that, unless a GP practice or, indeed, any other healthcare provider is willing to consider reflection on their practice, then it will be virtually impossible to effect the changes required to improve medicines related patient safety unless an alternative approach is adopted. Similarly, if practices are reluctant to make changes, then the only way forward is likely to rest with an external intervention.

Our study used ''audit and feedback'' as a part of the approach. These methods and others (individually or combined) have been widely used in an attempt to improve the quality of professional practice. A Cochrane review has shown the effects of audit and feedback to be generally small to moderate, with effects likely to be larger when baseline adherence to recommended practice is low.[9] As educational outreach visits (''academic detailing'') by a ''trained person'' appear to be a more promising approach to modifying health professional behaviour, especially prescribing,[10] our approach may have benefited from incorporating this in a formalised way. The clinical researchers in the present study drew upon an evidence base from the literature to justify the inclusion of the indicators, but only when specifically asked by members of practice staff.

It is notable that, in the geographical area where a PCT pharmacist supported the study, it often progressed more smoothly. Indeed, there is evidence that pharmacists have a potentially valuable role to play in reducing prescribing related problems at the individual patient level.[18–21] However, despite pharmacist support, there was a still a reticence to tackle the potentially problematic issues related to reviewing patients on long term benzodiazepines.

While it may be beneficial to use our approach more widely, we would suggest that it requires formal testing and evaluation. Indeed, this is the focus of future work in which we are involved. Furthermore, it is vital that the facilitator has the key skills required to help achieve change. Strong clinical skills and the ability to raise potentially sensitive issues in a non-judgemental way are paramount. Furthermore, training would need to encompass the principles and application of audit, educational outreach, and root cause analysis and the use of GP computer systems.

The indicators have the potential to be used more widely retrospectively (as in this study) or prospectively. Although reasonably comprehensive, they are to a degree limited by the fact that they do not encompass all instances of PDRM. They are likely to prove of greatest value if applied at both the population level and individual patient level.

Individual patient review is clearly an important part of reducing PDRM and facilitating the delivery of high quality

Key messages

- Data generated from applying PDRM indicators in general practice can be used to facilitate practice-wide discussion on medicines management issues.
- Different practices placed different priority levels on the issues they wished to take forward.
- Individual practice ''ownership'' of these issues, together with having a central committed figure at the practice, seemed to be key to the success of the process.

safe health care. However, in recent years the potential value of a systems approach has been brought to the fore.[1 2 22] In this study we therefore used the indicator data to try and generate discussion about changes that may be beneficial at a more global or systems level within each practice. Reviewing professional practice in this way potentially averts preventable events or, alternatively, allows some form of safety net to be built into the system. In addition, using the indicators prospectively in future work to identify patients "at risk" from a preventable event, rather than retrospectively, should have a greater positive impact on clinical outcomes. In any healthcare system, combining these approaches would therefore seem the most logical strategic way to proceed in attempts to facilitate improvements in the quality of patient care.

As a result of this work, we are about to embark on a cluster randomised controlled trial comparing a multifaceted pharmacist-led information technology based intervention with simple feedback in reducing rates of potentially inappropriate prescribing in primary care. If proved to be effective, it may be feasible and sustainable for this approach to become a potential part of the PCT pharmacist's role in the future.

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